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TRANSMITTAL FORM

(to be used for all correspondence after initial filing)

Total Number of Pages in This Submission

Application Number	09/785,858
Filing Date	February 16, 2001
First Named Inventor	Shane P. Leiphart
Art Unit	1745
Examiner Name	Gregg Cantelmo
Attorney Docket Number	MI22-1636

ENCLOSURES (Check all that apply)

- [x] Fee Transmittal Form
  - [x] Fee Attached
- [ ] Amendment/Reply
  - [ ] After Final
  - [ ] Affidavits/declaration(s)
- [ ] Extension of Time Request
- [ ] Express Abandonment Request
- [ ] Information Disclosure Statement
- [ ] Certified Copy of Priority Document(s)
- [ ] Reply to Missing Parts/ Incomplete Application
  - [ ] Reply to Missing Parts under 37 CFR 1.52 or 1.53
- [ ] Drawing(s)
- [ ] Licensing-related Papers
- [ ] Petition
- [ ] Petition to Convert to a Provisional Application
- [ ] Power of Attorney, Revocation Change of Correspondence Address
- [ ] Terminal Disclaimer
- [ ] Request for Refund
- [ ] CD, Number of CD(s) _____
  - [ ] Landscape Table on CD
- [ ] After Allowance Communication to TC
- [ ] Appeal Communication to Board of Appeals and Interferences
- [x] Appeal Communication to TC **(Appeal Notice, Brief, Reply Brief)**
- [ ] Proprietary Information
- [ ] Status Letter
- [x] Other Enclosure(s) (please Identify below):
  PTO Return Postcard Receipt

Remarks

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT

Firm Name	Wells St. John P.S.		
Signature	Jennifer J Taylor		
Printed name	Jennifer J. Taylor, Ph.D.		
Date	September 14, 2005	Reg. No.	48,711

CERTIFICATE OF TRANSMISSION/MAILING

I hereby certify that this correspondence is being facsimile transmitted to the USPTO or deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on the date shown below:

Signature			
Typed or printed name		Date	

EV633264973

PTO/SB/17 (12-04v2)
Approved for use through 07/31/2006. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Effective on 12/08/2004.
Fees pursuant to the Consolidated Appropriations Act, 2005 (H.R. 4818).

FEE TRANSMITTAL
For FY 2005

☐ Applicant claims small entity status. See 37 CFR 1.27

TOTAL AMOUNT OF PAYMENT ($) 500.00

Complete if Known	
Application Number	09/785,858
Filing Date	February 16, 2001
First Named Inventor	Shane P. Leiphart
Examiner Name	Cantelmo, Gregg
Art Unit	1745
Attorney Docket No.	MI22-1636

METHOD OF PAYMENT (check all that apply)

☑ Check ☐ Credit Card ☐ Money Order ☐ None ☐ Other (please identify): _____

☑ Deposit Account Deposit Account Number: 23-0925 Deposit Account Name: Wells St. John P.S.

For the above-identified deposit account, the Director is hereby authorized to: (check all that apply)

☐ Charge fee(s) indicated below ☐ Charge fee(s) indicated below, **except for the filing fee**

☑ Charge any additional fee(s) or underpayments of fee(s) under 37 CFR 1.16 and 1.17 ☑ Credit any overpayments

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FEE CALCULATION

1. BASIC FILING, SEARCH, AND EXAMINATION FEES

	FILING FEES		SEARCH FEES		EXAMINATION FEES		
		Small Entity		Small Entity		Small Entity	
Application Type	Fee ($)	Fee ($)	Fee ($)	Fee ($)	Fee ($)	Fee ($)	Fees Paid ($)
Utility	300	150	500	250	200	100	
Design	200	100	100	50	130	65	
Plant	200	100	300	150	160	80	
Reissue	300	150	500	250	600	300	
Provisional	200	100	0	0	0	0	

2. EXCESS CLAIM FEES

Fee Description	Fee ($)	Small Entity Fee ($)
Each claim over 20 (including Reissues)	50	25
Each independent claim over 3 (including Reissues)	200	100
Multiple dependent claims	360	180

Total Claims		Extra Claims		Fee ($)		Fee Paid ($)
_____	- 20 or HP =	_____	x	_____	=	_____

HP = highest number of total claims paid for, if greater than 20.

Indep. Claims		Extra Claims		Fee ($)		Fee Paid ($)
_____	- 3 or HP =	_____	x	_____	=	_____

HP = highest number of independent claims paid for, if greater than 3.

Multiple Dependent Claims	
Fee ($)	Fee Paid ($)
_____	_____

3. APPLICATION SIZE FEE

If the specification and drawings exceed 100 sheets of paper (excluding electronically filed sequence or computer listings under 37 CFR 1.52(e)), the application size fee due is $250 ($125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).

Total Sheets		Extra Sheets		Number of each additional 50 or fraction thereof		Fee ($)		Fee Paid ($)
_____	- 100 =	_____	/ 50 =	_____	(round **up** to a whole number) x	_____	=	_____

4. OTHER FEE(S)

	Fees Paid ($)
Non-English Specification, $130 fee (no small entity discount)	
Other (e.g., late filing surcharge): Brief of Appellant	500.00

SUBMITTED BY

Signature	Jennifer J. Taylor	Registration No. (Attorney/Agent) 48,711	Telephone 509-624-4276
Name (Print/Type)	Jennifer J. Taylor, Ph.D.		Date September 14, 2005

EV633264973

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application Serial No. 09/785,858
Confirmation No. 7367
Filing Date ..... February 16, 2001
Inventor.....Shane P. Leiphart
Assignee.....Micron Technology, Inc.
Group Art Unit.....1745
Office ..... Cantelmo, Gregg
Attorney's Docket No. MI22-1636
Customer No. 021567
Title: Method of Forming an Aluminum Comprising Line Having a Titanium Nitride Comprising Layer Thereon

BRIEF OF APPELLANT

To: MS Appeal Brief - Patents
Assistant Commissioner for Patents
Washington, D.C. 20231

From: Jennifer J. Taylor, Ph.D. (Tel. 509-624-4276; Fax 509-838-3424)
Wells St. John P.S.
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Spokane, WA 99201-3828

Appellant appeals from the April 26, 2005 Final Office Action rejecting claims 35-39, 41-48 and 75. A check is included in the amount of $500.00 in payment of the fees required under 37 CFR § 41.20(b)(2).

TABLE OF CONTENTS

I. REAL PARTY IN INTEREST.

The real party in interest of this application is Micron Technology, Inc. as evidenced by the assignment of the pending application to such party recorded at reel 013182, frames 0597-0601 on August 6, 2002, in the Assignment Branch of the Patent and Trademark Office.

II. RELATED APPEALS AND INTERFERENCES.

There are currently no appeals or interferences which will directly affect, be affected by, or have a bearing on the Board's decision in the pending appeal.

III. STATUS OF THE CLAIMS.

Claims 35-39, 41-48 and 75 are pending in the application with claims 1-34, 40 and 49-74 being previously canceled from the application. Claims 35-39, 41-48 and 75 stand finally rejected and are the basis for the present appeal.

IV. STATUS OF AMENDMENTS.

No amendments have been filed in the application subsequent to final rejection.

V. SUMMARY OF THE CLAIMED SUBJECT MATTER.

A concise explanation of the invention defined in the claims that are the subject of the present appeal follows. The invention pertains to a method of forming lines comprising aluminum and having a titanium nitride (TiN) layer over the line. The methodology of the invention is aimed at reducing defects in the TiN layer and minimizing processing time (page 2, line 21 through page 3, line 14).

Referring to Fig. 3, a substrate 32 having a diffusion region 34 is illustrated. An insulating layer 36 has a contact opening 38 extending to diffusion region 34. At the stage of processing shown in Fig. 3, a layer of titanium 40 has been deposited to provide a wetting layer as described in the text of the specification at page 6, line 20 through page 7, line 2.

Referring to Fig. 4, a layer of elemental aluminum or aluminum alloy 42, also referred to as first layer is deposited. As depicted in Fig. 4, first layer 42 can completely fill the opening and extend over insulative material 36. Deposition of first layer 42 is deposited in a processing tool with at least an outermost portion of the first layer being deposited at a deposition temperature of at least 400°C as described at page 7, line 24 through page 8, line 2.

A second layer 44 is formed over first layer 42 by depositing elemental titanium or a titanium alloy (page 8, lines 3-7). The outermost portion of the first layer is sustained at a temperature of at least 360°C prior to depositing the titanium (page 8, line 20 through page 9 line 12). The second layer contains an alloy of the deposited titanium and aluminum from the first layer (page 8, lines 8-10).

After formation of second layer 44, a layer of titanium nitride 46 is deposited over the second layer as shown in Fig. 6 and described at page 9, lines 7-9. The resulting construction is subjected to photopatterning to form a conductive line 50 as depicted in Fig. 7 and described at page 10, lines 6-10.

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL.

The grounds of rejection presented for review and position of the Office are concisely stated as follows.

The rejection of independent claim 35, and claims 36-39, 41-45 and 75 which depend therefrom, under 35 U.S.C. § 103(a).

Independent claim 35 and its dependent claims 36-39, 41-48 and 75 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over a combination of: U.S. Patent No. 5,582,881 issued to Besser et al. (henceforth "Besser"); U.S. Patent No. 6,140,288 issued to Shan (henceforth "Shan"); U.S. Patent No. 5,909,635 issued to Marieb (henceforth "Marieb"); and U.S. Patent No. 5,925,933 issued to Colgan (henceforth "Colgan").

In the Office Action dated April 06, 2005 (henceforth "Action"), the Office indicates reliance upon Besser as disclosing methods of sputtering aluminum or aluminum alloy films, followed by sputtering titanium films on the aluminum layer (Action at pages 2-3). The Besser disclosure is relied upon as teaching processing temperatures and forming a titanium alloy with aluminum from the aluminum-comprising layer during deposition of

titanium (Action page 3, paragraphs 1-2). Besser is also relied upon as disclosing a wetting layer (Action page 8, paragraph 6). At page 4 of the Action, the Office indicates that the differences between Besser and Appellant's claims are that Besser does not disclose the following features of claim 35: forming the outermost portion of the aluminum layer at a temperature of at least 400°C; preventing the outermost portion of the layer from cooling below 360°C during deposition of titanium; formation of the layers into a conductive line; and providing a substrate having an opening extending through an insulating layer to a diffusion region. The Office additionally acknowledges failure of Besser to teach or suggest various features recited in the dependent claims.

Shan is indicated as being relied upon for disclosure of maintaining a semiconductive wafer at a relatively high temperature to allow reflow (present action at page 4, paragraphs 3-4). The Office contends that it would be obvious to modify the teachings of Besser by depositing an outer portion of aluminum at a temperature of at least 400°C to allow reflow as described in Shan.

The Office indicates at page 5 of the present Action that Marieb is relied upon as disclosing accelerating a reaction between titanium and aluminum to form a $TiAl_3$ product by maintaining a temperature of greater than 350°C. The Office contends that it would be obvious to maintain the temperature to be greater than 350°C during the formation of Ti/Al depositing as described by Besser in light of these teachings of Marieb. Motivation for such combination is indicated as being optimal temperature conditions for reacting aluminum and titanium (action at page 6).

At page 7 of the present Action the Office indicates that since Marieb teaches that a titanium deposition temperature must be 350°C to 450°C to cause formation of $TiAl_3$ "it would not have been obvious to permit the aluminum layer to cool below the minimum

temperature required for the formation of $TiAl_3$ in the adjacent deposition step since it would have reduced the throughput of the system by requiring an additional heating step prior to depositing the titanium".

At pages 7-8 of the present Action the Office indicates reliance on Colgan as disclosing formation of an interconnect by deposition of aluminum followed by Ti and TiN with the resulting layers being photolithographically etched to form patterned lines. Shan is also relied upon as disclosing photopatterning a multilayer structure into conductive lines (Action page 8, second paragraph). Combining the Shan and Colgan disclosures of patterning to form conductive lines with the teachings of Besser, the Office contends that it would be obvious to photopattern the layers into conductive lines as recited in claim 35.

A combination of Shan and Besser is indicated as rendering the recited structure of claim 35 obvious with respect to "the substrate arrangement" (Action page 9, paragraph 3) because Shan teaches metallization including providing a dielectric layer, forming contacts or vias in the substrate and depositing multi-layer metallization layers on the substrate, while Besser indicates processing designed for fabrication of semiconductor devices and that uses can include vias or contacts (Action page 8, paragraph 6 through page 9, paragraph 4).

VII. ARGUMENT.

The rejection of independent claim 35, and its dependent claims 36-39, 41-48 and 75 should be overturned since a *prima facie* case of obviousness has not been established.

In accordance with MPEP §§ 2142 and 2143, a proper obviousness rejection has the following three requirements: 1) there must be some suggestion or motivation to modify or combine reference teachings; 2) there must be a reasonable expectation of success; and 3) the combined references must teach or suggest all of the claim limitations. In order to establish a *prima facie* case of obviousness, each of these three factors must be shown, the burden of which is upon the Office (MPEP § 2142). Appellant respectfully submits that the Office has failed to meet this burden, no *prima facie* case has been established and claims 35-39, 41-48 and 75 are therefore allowable.

Referring to independent claim 35, such recites providing a substrate having an opening extending through an insulating layer to a diffusion region and physical vapor depositing a first layer comprising at least one of elemental aluminum or an aluminum alloy where the first layer is deposited over the insulating layer and filling the opening. Claim 35 additionally recites physical vapor depositing titanium (elemental or alloy) on the first layer to form a second layer. An outermost portion of the first layer is deposited at a temperature of at least 400°C and is sustained at a temperature of at least 360C prior to depositing the titanium. Claim 35 further recites depositing a third layer comprising titanium nitride on the second layer and photopatterning the first, second and third layers into a conductive line over a contacting plug within the opening. If any one of these recited features, or a combination thereof, is not disclosed or suggested by the combination of

references relied upon by the Office a *prima facie* case of obviousness has not been established.

In order to establish a *prima facie* case of obviousness, the references relied upon by the Office must suggest the recited depositing of a first layer of Al or Al-alloy over the insulating layer where the first layer fills the opening and wherein a layer of titanium/aluminum alloy is formed on the first layer. There must be a suggestion to deposit the outermost portion of this recited first layer at a temperature of at least 400°C and sustaining a temperature of the outermost portion of at least 360°C prior to depositing Ti to form the Ti/Al alloy. Besser discloses formation of various metal comprising layers which can include elements such as titanium, aluminum, or a mixture thereof. As acknowledged by the Office at page 4 of the present Action, Besser does not disclose or suggest an insulating layer having an opening extending through to a diffusion region or formation of a first layer over a substrate having an insulative layer and opening extending therethrough. Accordingly, Besser does not disclose or suggest the claim 35 recited formation of a first layer over an insulating layer and filling an opening through the insulating layer. Nor does Besser disclose or suggest depositing an outermost portion of an Al-comprising layer at a temperature of at least 400°C and maintaining a temp of at least 360°C until depositing of Ti on the Al-layer which fills the opening.

The Office indicates reliance upon Colgan as suggesting photopatterning of layers. Nothing in Colgan contributes toward suggesting the claim 35 recited formation of a first layer comprising aluminum over an insulating layer and filling an opening which extends through the insulating layer.

Marieb is indicated as being relied upon as disclosing heating of a device having a titanium layer over aluminum at a temperature of 350°to 450°C in order to alloy Ti and Al.

However, Marieb indicates this heating in association with Ti deposition over a conductive structure which occurs after formation of a multilayer structure and etching to form the conductive structure (Col 3, ll. 3-31).. Such disclosure does not suggest or contribute toward suggesting the specifically recited depositing of the outermost portion of the Al-comprising layer at the recited temperature or the recited sustaining of the temperature of the Al-comprising layer prior to Ti deposition. Nor does Marieb contribute toward suggesting the claim 35 recited formation of such aluminum-comprising layer over an insulating layer and filling an opening through the insulating layer.

With respect to the Offices statement that Marieb "teaches that the temperature of titanium on the aluminum layer must be 350-450° C to cause the formation of TiAl3" (Action page 7, first paragraph), appellant notes that such statement is in error. Marieb specifically states that "[h]eat , in the range of approximately 350 degrees Celsius (C°.) is applied to *accelerate* the chemical reaction between the aluminum and the titanium" (emphasis added, *Marieb*, col. 3, ll. 27-30), and that "[t]he application of heat simply accelerates the reaction" (id, col. 3, ll. 31-32). Accordingly, the Office's contention in reliance upon this statement to support the present obviousness rejection is unfounded. Further, the Office's finding that "it would not have been obvious to permit the aluminum layer to cool below the minimum temperature required for the formation of $TiAl_3$ in the adjacent deposition step since it would have reduced the throughput of the system by requiring an additional heating step prior to depositing the titanium" is not based upon the standard for determining obviousness. A *prima facie* case under § 103 requires a showing of what is obvious, irrelevant of what is not obvious.

At pages 8-9 of the present Action the Office addresses the claim 35 limitation of forming a contact opening within an insulative material and depositing a first layer

comprising aluminum over the insulating layer and filling the opening. In addressing such limitation the Office indicates the combination of Besser and Shan as rendering obvious the recited subject matter. Specifically, the Office indicates that although Besser does not disclose the recited opening through an insulating layer, such openings are common, and that Besser indicates that the disclosed multilayer structure can be utilized for vias or contacts in semiconductor devices. The Office indicates that this commonality of vias in combination with the metallization disclosed by Shan renders claim 35 obvious because Shan discloses providing a via within a dielectric layer and subsequently depositing multilayer metallization layers 3-8 on the substrate (present Action page 9).

Referring to Shan Fig. 1, an opening is disclosed as extending through a dielectric layer 1. A wetting layer 3 is deposited and comprises Ti (see column 8, lines 56-57). A seed layer 4 is then formed over the wetting layer with the seed layer being deposited in a cold deposition step for an amount of time to ensure coverage of the substrate surface and typically being an amount of metal less than or equal to about 25% of the overall thickness of the metal layer to be formed (column 6, line 31 through column 7, line 15). As depicted in Fig. 1, seed layer 4 only partially fills opening 2. After formation of the seed layer, Shan discloses a second step utilizing slow hot deposition which fills the remainder of the opening (Fig. 1 and text at columns 17-20). Such second step utilizing slow hot deposition can have a temperature of 300°C to 420°C (column 7, lines 32-33). The power and rate of deposition is then increased to continue deposition and form an outermost portion of the material at a temperature of <u>from 350°C to 390°C</u> (column 8, lines 41-53).

Referring again to the language of Appellant's independent claim 35, it is noted that the recited first layer comprising aluminum is required to fill the opening with an outermost portion being deposited at a temperature of at least 400°C. The claim language

additionally requires titanium alloy to be deposited on the first layer without cooling of the outermost portion to less than 360°C. This processing is illustrated in Fig. 4 which indicates first layer 42 filling the opening and subsequent formation of second layer 44 during depositing of titanium material as shown in Fig. 5. In the Shan disclosure, none of the resulting layers meet the requirement of independent claim 35 recited limitation of a first layer formed over the insulating layer and filling a gap with the outermost portion of the layer being deposited at a first deposition temperature of at least 400°C, where subsequent deposition of titanium alloy on the first layer forms a second layer comprising an alloy of the deposited titanium and aluminum from the first layer.

It is noted with respect to the Shan disclosure that deposition during the slow hot step can be at a temperature of up to 400°C and that such second step fills the opening. However, deposition is continued at a substrate temperature of from 350°C to 390°C. Therefore, if combined layers 4, 5 and 6 are interpreted as being the "first layer" the outermost portion is not formed at a temperature of greater than or equal to 400°C as required in independent claim 35. If layer 5 is interpreted as being the "first layer" there is no suggestion or teaching of depositing a titanium alloy on such layer to form an alloy including aluminum from such first layer as required in claim 35 since the only disclosure in Shan is to increase deposition rate of "the metal" during a third deposition step. Accordingly, the combination of Besser, which fails to disclose or suggest any particular structure having an opening extending through an insulating layer to a diffusion region or formation of any specified layers within or filling such opening, and Shan which fails to fairly suggest the claim 35 recited forming a first layer which fills an opening, has an outermost portion deposited at a temperature of at least 400°C, and has a subsequent titanium alloy deposited thereon, fails to disclose or suggest each and every element of claim 35.

Since the cited combination of references fails to disclose or suggest each and every element of claim 35, no *prima facie* case has been established. At page 10 of the present action the Office indicates that previous rejections have been maintained because "Applicant's response does not provide any clear and convincing evidence that the prior art rejection does not teach or suggest the claimed invention, and in particular depositing a first layer comprising elemental aluminum or an aluminum alloy, the layer being formed over an insulating layer and filling an opening within the insulating layer". Appellant again notes with reference to MPEP § 2142 that the burden to establish a *prima facie* case is on the Office. Appellant need only provide evidence once the Office's burden has been met. As indicated above, the Office has failed to meet this burden. In contrast to the statement of the Examiner in the present Action, it is not Appellant's burden to provide "any clear and convincing evidence". Since no *prima facie* case has been established, independent claim 35 is allowable over the art of record.

Dependent claims 36-39, 41-48 and 75 are allowable over the various cited combinations of Besser, Shan, Colgan and Marieb for at least the reason that they depend from allowable base claim 35.

Conclusions

For the reasons discussed above, claims 35-39, 41-48 and 75 are allowable over the art of record. In view of the forgoing, reversal of the final rejection of claims 35-39, 41-48 and 75 and formal allowance of such claims is respectfully requested.

Respectfully submitted,

Dated: September 14, 2005 By: Jennifer J. Taylor

Jennifer J. Taylor
Reg. No. 48,711

VIII. CLAIMS APPENDIX.

Claims 35-39, 41-48 and 75 stand finally rejected and are the basis of the present appeal are presented below.

35. A method of forming an aluminum comprising line having a titanium nitride comprising layer thereon, the method comprising:

providing a substrate having an opening extending through an insulating layer to a diffusion region;

in a processing tool, physical vapor depositing a first layer comprising at least one of elemental aluminum or an aluminum alloy over the substrate in a first chamber, the first layer being formed over the insulating layer and filling the opening, at least an outermost portion of the first layer being deposited at a first deposition temperature of at least 400°C;

physical vapor depositing a titanium alloy on the first layer in a second chamber of the processing tool while at least an outer portion of the first layer is at a temperature of at least about 360°C, and forming therefrom a second layer comprising an alloy of titanium and the aluminum from the first layer in the second chamber during said depositing, the alloy having a higher melting point than that of the first layer, and wherein essentially all the physical vapor deposited titanium alloys with the aluminum of the first layer during the depositing, the outermost portion of the first layer sustaining a temperature of at least 360°C between the depositing the first layer and the depositing the titanium alloy on the first layer;

physical vapor depositing a third layer comprising titanium nitride on the second layer;

removing the substrate from the processing tool after depositing the third layer; and

photopatterning the first, second and third layers into a conductive line over a contacting plug within the opening and in electrical connection with the diffusion region.

36. The method of claim 35 comprising depositing the second layer to have a thickness of from about 50 Angstroms to about 150 Angstroms.

37. The method of claim 35 comprising depositing the second layer to have a thickness of from about 100 Angstroms to about 200 Angstroms.

38. The method of claim 35 wherein the first layer consists essentially of elemental aluminum, an aluminum alloy, or a mixture thereof.

39. The method of claim 35 wherein the first layer consists essentially of elemental aluminum.

41. The method of claim 35 wherein temperature of at least an outer portion of the first layer is at least about 360°C during the physical vapor depositing of the third layer.

42. The method of claim 35 wherein the third layer physical vapor depositing occurs in the second chamber of the processing tool.

43. The method of claim 35 wherein the physical vapor depositing of the titanium alloy on the first layer in the second chamber of the processing tool forms a second layer comprising an alloy of titanium and the aluminum from the first layer in the second chamber during said depositing.

44. The method of claim 35 wherein the first deposition temperature is at least about 450°C.

45. The method of claim 35 wherein the first deposition temperature is greater than 450°C.

46. The method of claim 35 wherein after the first layer physical vapor depositing and before beginning the physical vapor depositing of the titanium alloy, letting the outermost portion of the first layer cool from the first deposition temperature by 25°C or less.

47. The method of claim 35 wherein the first deposition temperature is at least about 450°C, and wherein after the first layer physical vapor depositing and before beginning the physical vapor depositing of the titanium alloy, letting the outermost portion of the first layer cool from the first deposition temperature by 25°C or less.

48. The method of claim 35 wherein the first deposition temperature is greater than 450°C, wherein after the first layer physical vapor depositing and before beginning the

physical vapor depositing of the titanium alloy, letting the outermost portion of the first layer cool from the first deposition temperature by 25°C or less.

75. The method of claim 35 further comprising:

prior to depositing the first layer depositing a wetting layer within the opening; and

wherein the depositing the first layer over the substrate comprises depositing the first layer over the wetting layer.

IX. EVIDENCE APPENDIX.

None entered.

X. RELATED PROCEEDINGS APPENDIX.

No decisions entered.